

Pathways of development of dynamic capabilities for servitization transformation: A longitudinal multi-case study

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ABSTRACT

Servitization is a transformation process requiring manufacturers to develop dynamic capabilities to support the change process and overcome emerging challenges over time. In this paper, we study pathways of development of dynamic capabilities for servitization transformation (the sequence of the development of capabilities and how they work together over time) and how they relate to servitization transformation outcomes. We do so based on six longitudinal in-depth case studies of manufacturing firms which, having departed from similar servitization maturity starting points, followed different capability development pathways in their transformation processes and achieved different outcomes. We found that successful pathways of development of capabilities for servitization transformation are associated with (1) developing (first-order) dynamic service provision capabilities sequentially, following a specific order over time and (2) developing (second-order) dynamic reconfiguring capabilities to overcome challenges and sustain the development of service provision capabilities and the transformation process. Our study contributes to the literature by providing an in-depth understanding of how the pathways of development of dynamic capabilities over time influence the outcomes of the servitization transformation process. It is one of the first studies to unveil in detail mechanisms by which different reconfiguring and service provision capabilities work together over time to facilitate the servitization transformation process.

1. Introduction

Servitization is a transformation process by which a manufacturing firm adds services to their core product offering to provide innovative, high-value, integrated solutions to their customers and achieve competitive advantage (Davies, 2004; Mohanbir et al., 2004; Penrose & Penrose, 2009; Wise & Baumgartner, 1999). Servitization has been widely recognised as a way to deal with competitiveness in the global market and has been promoted by many governmental initiatives (MBIE, 2013).

Manufacturers servitize by offering different types of services, ranging from basic services (oriented to the functioning of the product, e.g., repairs and maintenance) to advanced services (designed to support product utilization and its adaptation to a customer's unique needs) (Baines et al., 2020; Sousa & Da Silveira, 2017). The latter are high-value services that include outcome-based contracts, customer training, consulting, among others. The offering of advanced services is often considered as a key distinctive feature of “servitized” versus “non-

servitized” manufacturers, and as the main trigger for significant transformation (Baines et al., 2020; Sousa & Da Silveira, 2020). It is the introduction of advanced services that ultimately delivers servitization's intended goals of differentiation and competitive advantage (Sousa & Da Silveira, 2020), but is also such introduction that requires major changes in the manufacturer's capabilities (Sousa & Da Silveira, 2017). Researchers agree that the transformation process towards advanced services is complex and loosely structured (Baines et al., 2020), and involves the management of profound change as well as overcoming challenges that arise over time (Bigdeli, Kapoor, Schroeder, & Omidvar, 2021). Thus, firms need to develop capabilities that enable them to change, i.e., dynamic capabilities.

Dynamic capabilities are defined as the firm's ability to sense and then seize new opportunities, and to reconfigure competencies with the goal of achieving a sustained competitive advantage (Augier & Teece, 2009; Teece et al., 1997). These capabilities seek to adapt a firm's resource base to evolving customer demands and market trends, such as an increased demand for services, as well as to influence their

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environment through innovation and collaboration with customers and other relevant actors (Teece, 2007). Dynamic capabilities enable a firm to change (e.g., extend, modify, create) its operational routines (or zero-order capabilities), which are oriented to supporting the performance of “an activity on an on-going basis using more or less the same techniques on the same scale to support existing products and services for the same customer population” (Helfat & Winter, 2011; Winter, 2003).

Our study aims to contribute to an increased understanding of the process of dynamic capability development (change) that manufacturers go through when they introduce advanced services (Baines et al., 2020), namely, how does (or should) capability development occur. Studies on servitization transformation have often faced limited access to longitudinal data and, as a consequence, have not addressed in sufficient depth the dynamic aspects of the transformation process. In particular, we still know little about desirable pathways of development of dynamic capabilities over time (Dmitrijeva et al., 2020; Kanninen, Penttinen, Tinnilä, & Kaario, 2017; Kowalkowski et al., 2017), that is, the sequence by which firms should develop dynamic capabilities to support the transformation process over time. Our study contributes to the literature by seeking to understand in-depth how the pathways of development of dynamic capabilities over time influence the outcomes of the servitization transformation process (i.e., the holistic assessment of the transformation process, involving financial and non-financial aspects (Lexutt, 2020)).

To do so, our study examines six longitudinal in-depth case studies of manufacturing firms which, having departed from similar servitization maturity starting points, followed different capability development pathways in their transformation processes towards advanced services and achieved different outcomes. The in-depth case studies allowed for sound empirical research drawing on the notion of micro-foundations, which are the basic building blocks (skills, processes, organizational structures) from which organizational dynamic capability is built (Teece, 2007; Winter, 2003). The notion of micro-foundations allows researchers to drill down to a finer level of detail, closer to practice.

Benefitting from the longitudinal and in-depth data of our study, we address three goals related to pathways of development of dynamic capabilities. First, we aim to examine the extent to which firms adopt universal sequences of capability development, as opposed to sequences adapted to their own specific contexts. Second, we seek to understand the relationship between the decision to adopt sequential pathways (firms develop the required capabilities one at a time) versus parallel pathways (firms develop the capabilities all at once) and the outcomes of the servitization transformation process. Third, we examine interactions between different types of dynamic capabilities over time. We distinguish between two types of dynamic capabilities (Winter, 2003). The first type are first-order dynamic capabilities, that allow for the development and delivery of advanced services (further referred to as ‘service provision capabilities’). These capabilities enable the firm to change its routines to expand the portfolio of services over time (Lütjen et al., 2017). The second type are second-order dynamic capabilities that are required to sustain the momentum for organizational change over time (further referred to as ‘reconfiguring capabilities’). These enable firms to overcome challenges that emerge along the process by reconfiguring first-order capabilities (Bigdeli et al., 2021; Brax, Calabrese, Ghiron, Tiburzi, & Grönroos, 2021). Our research is particularly novel, as we are not aware of servitization studies explicitly addressing longitudinal interactions between different types of dynamic capabilities. Unlike other studies, we disaggregate dynamic capabilities into first and second-order dynamic capabilities and uncover how they work together over time to facilitate the servitization transformation process. This disaggregation, in combination with linking capability development pathways to actual servitization outcomes, provides a more nuanced viewpoint on the role of dynamic capabilities in the servitization process.

2. Conceptual background

2.1. Servitization transformation process

The servitization transformation process has been addressed from two main perspectives. The first relates to the content of the change (what manufacturers have changed) and focuses on the evolution of the portfolio of services over time, as firms progress from basic to advanced services (e.g., Oliva & Kallenberg, 2003; Kowalkowski et al. (2015); Lütjen et al. (2017)). During service transition, the service innovativeness of manufacturers increases, requiring additional resources and higher degrees of organizational change (Lütjen et al., 2017). In this context, dynamic capabilities are expected to be key to support the transition. The servitization literature has drawn on the concept of (first-order) dynamic capabilities to address the expansion of the service portfolio of firms over time. In particular, such research has focused on identifying dynamic capabilities for servitization at different stages along the evolution of the service portfolio over time (Kanninen et al., 2017; Saul & Gebauer, 2018).

The second perspective has focused on the description of the organizational change process through which firms go through when servitizing. Existing studies agree that the transformation process displays, to a more or less extent, continuous change which is not structured (Baines et al., 2020; Martinez et al., 2017). Servitization transformation involves continuous modifications, adaptability, recalibration of opportunities, in the spirit of agile incrementalism (Kowalkowski et al., 2012). Organizations continually monitor and respond to the external and internal environment in small steps as an ongoing process. The change is rather emergent and iterative in nature and transformation processes do not follow a single path.

Moreover, significant challenges arise along the way (Zhang & Banerji, 2017; Ziaee Bigdeli et al., 2021), that can even lead an organization to abandon servitization (Valtakoski, 2017). Lütjen et al. (2017) have identified different types of barriers manufacturers experience when servitizing: in the initial stages, firms seem to face strategy-related barriers, followed by implementation-related barriers in the service anchoring stage and market-related barriers in the service extension stage. Interestingly, there seem to be typical barriers that are more prominent at certain stages in the transition process (Lütjen et al., 2017; Raja et al., 2017). Bigdeli et al. (2021) found that the servitization process disrupts the manufacturer's established product-focused capabilities, creating a range of resources and competency-based challenges. They concluded that these challenges demand management interventions, namely, the control and careful development of service capabilities. Oliva and Kallenberg (2003) suggest that it is crucial to understand the challenges emerging during the change process and how they trigger organizational actions as a response. Thus, in the context of organizational change, second-order capabilities are expected to be key to sustain the momentum for change over time and to enable firms to overcome challenges and reconfigure first-order capabilities along the transformation process (Bigdeli et al., 2021; Brax et al., 2021).

Extant research on the servitization transformation process has suffered from three main limitations in understanding the role of dynamic capabilities over time. First, it has not explicitly addressed pathways of development of first- and second-order dynamic capabilities over time. Second, most empirical studies have not been longitudinal (an exception is Baines et al., 2020). Retrospective studies suffer from validity issues in understanding the unfolding of processes over time, such as determining cause and effect or the interpretation of events being subject to bias (e.g., post-rationalization by respondents) (Yin, 2018). Third, empirical studies have so far focussed primarily in describing the change process (e.g., Baines et al., 2020; Bigdeli et al., 2021; Martinez et al., 2017) having stopped short of making a connection between such change processes and servitization outcomes. Taken together, these limitations have prevented an adequate understanding of desirable pathways of development of dynamic capabilities, as well as the capturing of

interactions between different types of dynamic capabilities over time. Our study aims to address these limitations.

2.2. Pathways of development of dynamic capabilities

In the strategy literature, it has been suggested there may be numerous “multiple paths (equifinality) to the same dynamic capabilities” (Eisenhardt & Martin, 2000). This view is echoed in the manufacturing strategy literature, that posits that firms can develop different portfolios of operations capabilities, which could produce similar levels of competitive advantage (e.g., Wu, Wu, Chen, & Goh, 2014). Likewise, the servitization literature suggests that firms may follow different paths to servitization (e.g., Brax et al., 2021; Martinez et al., 2017) which implies that a firm's development of dynamic capabilities for servitization transformation might also follow various pathways. Yet, we are not aware of servitization studies which have mapped pathways of development of dynamic capabilities, i.e., the sequence of development of dynamic capabilities over time, or empirically examined the longitudinal relationship between dynamic capability development pathways and servitization outcomes.

While a few empirical studies have made relevant inroads into the topic, they have shed incomplete insights into capability development pathways. We next review briefly four such studies which relate more closely to our own (Baines et al., 2020; Bigdeli et al., 2021; Lütjen et al., 2017; Saul & Gebauer, 2018). As indicated earlier, Lütjen et al. (2017) retrospective study found that firms increased service innovativeness along the transformation process, alluding to the increased development of first-order dynamic capabilities over time. Baines et al. (2020)'s longitudinal study identified internal and external context factors (organizational readiness, organizational commitment, customer pull and value network positioning) that affect the rate of progression along the transformation journey. While some of these contextual factors are akin to capabilities, the study did not map the pathways of development of such capabilities over time and their influence of specific decisions within the process. The authors call for future research to investigate whether there are distinct sequences of activities through the pathways and how they relate to servitization journey outcome measures, such as the rate of progression along the journey or the efficiency and effectiveness with which advanced services are provided.

Based on retrospective case studies, Bigdeli et al. (2021) identified several root causes of competency-related challenges that occur during servitization transformation (manufacturer's lack of knowledge on service industry practices and customer's service requirements; lack of willingness to use external service competencies; lack of service competencies due to excessive outsourcing). They uncovered a set of management interventions oriented towards dealing with such challenges. While some of the interventions relate to (mostly) first-order dynamic capability development (acquiring service industry knowledge from external sources; develop competency to understand customer needs and improve service quality; systematically plan service capabilities), the study does not capture the time dynamics of the occurrence of the challenges and associated capability development and reconfiguring efforts.

Saul and Gebauer (2018) identified 10 micro-foundations of dynamic capabilities, organized around sensing (opportunities, customers, customer needs, dynamics of customer needs, resource situation), seizing (scope of the offering, solution conceptualization, individualization, customer segments) and reconfiguring (organizational resources, solution modifications). This list was compiled from seven retrospective case studies, but no actual pathways of capability development were examined. As explained earlier, besides understanding the specific sequence of development of individual dynamic capabilities over time, it is important to ascertain whether capabilities should be developed one at a time (sequential pathway) or simultaneously (parallel pathway). The strategy literature indicates that while the parallel pathway approach may leverage synergies in developing the individual

capabilities simultaneously, it may result in shortage of resources and increase the risk of failure (Teece et al., 2016). In the manufacturing strategy literature, the sandcone model (Ferdows & De Meyer, 1990) alludes to the desirability of developing operations capabilities in an adequate sequence (sequential pathway), leading to the formation of a cumulative capability (Schroeder et al., 2011). In a similar vein, Wu et al.'s (2012) findings suggest that firms should not attempt to develop too many operations capabilities, because of the vast amount of resources, time and change involved.

In the servitization literature, one finds different perspectives about desirable pathways. A mainstream view highlights the challenge of developing multiple capabilities over time (Kohtamäki et al., 2020), because of the high level of resources and investment that are required. Studies also warn about the risk of competition for resources between the product and service businesses, which may result in added risks for the organisation (Fang et al., 2008; Josephson et al., 2016). If the pathway of development of capabilities is not adequate, the risk of failure increases (Visnjic et al., 2012) and may lead to negative servitization outcomes and a “servitization paradox” (Kowalkowski et al., 2017). Firms often expect immediate returns from services when they have invested heavily upfront and gone through the timely challenge of reallocating resources (Gebauer et al., 2005) and the absence of such immediate returns may compromise stakeholders' motivation to sustain the transformation process. Neely (2008), for instance, reports that the number of bankrupting firms is often higher than expected in a pool of servitizing firms. However, others suggest that successful servitization transformation requires a holistic, system-wide change inside the organisation, as well as across the value chain (Ng et al., 2013; Visnjic et al., 2012), pointing to synergies resulting from the simultaneous development of capabilities (parallel pathway).

In this context, our study aims to enrich our understanding of pathways of development of dynamic capabilities, in particular: i) the relationship between the decision to adopt sequential pathways versus parallel pathways and the outcomes of the servitization transformation process; and ii) the interactions between the development of first- and second-order dynamic capabilities over time.

2.3. Servitization transformation outcome

The measurement of servitization outcome – or servitization “success” – remain a contested issue in the servitization literature (Lexutt, 2020). On the one hand, the outcomes of servitization are determined by financial performance of a firm. The underlying logic for using financial measures is the expected financial benefit of developing services. For example, financial performance is measured in terms of profitability - at firm level or focused specifically at service profitability (Gebauer & Putz, 2007). Other measures of financial performance include revenue and profit growth (Eggert et al., 2014) or share of service revenue (Lexutt, 2020). There is, however, growing consensus that servitization outcomes cannot be purely captured by financial measures alone. Hence, more comprehensive sets of dimensions to assess the outcomes of the transformation process are often recommended (Lexutt, 2020; Ziaee Bigdeli et al., 2018): including measures such as better product functionality or higher customer loyalty (Pan & Nguyen, 2015) and the extent to which advanced services have been introduced in the firm's portfolio (Sousa & Da Silva, 2017).

In our study, we take a holistic view of the measurement of servitization outcome. We distinguish between high, medium and low achievers based on a set of financial and non-financial criteria. These criteria include overall financial performance, service business performance and the extent of provision of advanced services (we further discuss our measurement of servitization outcomes in Section 3.3.).

2.4. Conceptual framework

The conceptual framework is depicted in Fig. 1. We seek to

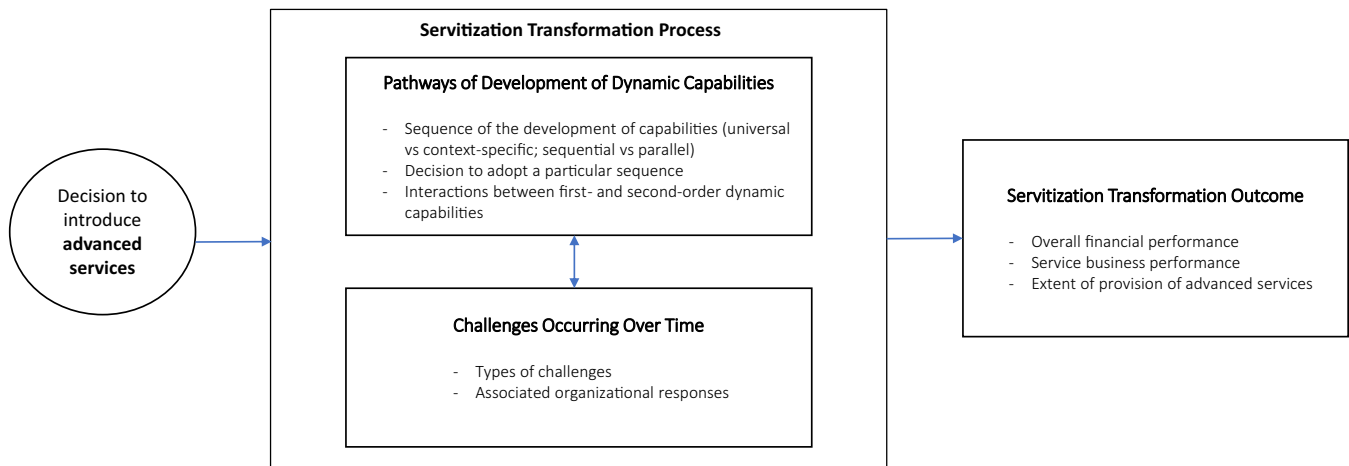


Fig. 1. Conceptual Framework.

understand the pathways of development of dynamic capabilities during the servitization transformation process - starting with the decision to introduce advanced services – and how they relate to holistic outcomes of the servitization transformation process. First, we examine the extent to which firms adopt universal sequences of capability development or sequences adapted to their own specific contexts. Second, we address the relationship between the decision to adopt sequential pathways versus parallel pathways and the outcomes of the servitization transformation process. Third, we study interactions between first- and second-order dynamic capabilities over time. In doing so, we examine the challenges arising during the transformation process and how they trigger organizational response and, ultimately an action that leads (or does not lead) to a change and development of service provision dynamic capabilities.

3. Method

3.1. Research design and empirical setting

Servitization transformation represents a complex and longitudinal process. For this reason, we have employed a longitudinal multi-case study approach (Eisenhardt, 1989; Yin, 2018) to investigate the transition from basic to advanced services in six manufacturers based in New Zealand between 2015 and 2018. Eisenhardt (1989) suggested four to ten cases as an adequate number for theory building case research. Six cases strike an adequate balance between in-depth analysis of each case (Eisenhardt, 1989; Voss et al., 2002) and the generation of reliable and generalizable theory whilst keeping the data set manageable (Miles et al., 2019). In line with our research goals, we looked for firms that i) were exemplar manufacturers (typically, leaders in their market segment with significant international outreach or significant domestic standing); and ii) at the start of the study, offered only basic services and had decided to start offering advanced services at the beginning of our research project. We purposefully chose firms that had recently decided to introduce advanced services because these typically require more profound change and more challenging servitization transformation than basic product-oriented services such as repair and provision of spare parts. The six cases provide a tightly controlled setting to study servitization transformation, since the firms started the transformation process at about the same time and at similar servitization maturity levels, in the same country.

We initially identified a list of firms from the Ministry of Business Report 2013 (Mbie, 2013), which highlighted New Zealand manufacturing firms who indicated their intent to servitize. The report was produced as part of a broader governmental initiative to encourage manufacturing firms to transform towards servitization. We also reached

out to various industry experts such as regional development agencies and member associations, who had servitizing firms as members. Drawing on these sources, we selected a group of eight firms which seemed to fit the study requirements and invited them to participate in the research. Six of these accepted and were later validated in the field work as meeting the set requirements. Table 1 provides a summarized description of each firm and outlines the sources of data that contributed to the study.

3.2. Data collection

The data was collected between 2015 and 2018 and comprised three stages (see Table 2). In each stage, we determined the key objectives that we aimed to achieve and collected data to fulfil these objectives. At the first stage, we learned about firms and their context, and performed an evaluation of their servitization status (namely in terms of service offerings and existing capabilities). Specifically, we ascertained that each firm was an “exemplar manufacturer” (as defined above), was already offering basic services and had recently decided to introduce advanced services. In the second stage (2015–2018), we monitored the transformation process as firms developed their advanced services offering. This included the determination of pathways in the development of first-order capabilities, the challenges that were experienced and the emergence of second-order reconfiguring capabilities. We also examined the pathways to development of reconfiguring capabilities and their linkage to first-order capabilities. The third stage took place in 2018 and focussed on the assessment of the outcome of the servitization transformation in each firm.

Data collection was supported by a case research protocol listing the main areas to address, indicative interview questions and other potential sources of information. It involved semi-structured interviews, direct observation through site visits and the analysis of company documents, such as annual reports and website blogs. We also collected secondary performance related data from Technology Investment Network (TIN) reports (TIN, 2016, 2018), from governmental reports, media releases and liquidation reports from creditors. These multiple sources of data were used to triangulate the findings (Eisenhardt, 1989).

The data collection process was centred around interviews with key informants. The interviews were conducted at firms' premises (apart from the interviews with former CEOs) and followed by a visit of individual departments and/or business units. During the visits, informal interviews with ‘other informants’ were also conducted (the number of interviews is outlined in Table 1). The interviews ranged from one to two hours long with the subsequent visits lasting up to two hours. Appendix A shows the list of open-ended interview questions that were used in the three stages of the study. The interview questions were aimed at CEOs;

Table 1
Case study firms.

Characteristics	FIRM A	FIRM B	FIRM C	FIRM D	FIRM E	FIRM F
Domain	Communications devices	Healthcare devices	Construction materials	Appliances	Heavy Manufacturing	Agricultural Technologies
Founded	1962	1992	1987	1942	2001	1964
Size (no. of employees)	600	20	95	300	50	548
Geographical markets	98% Overseas	98% Overseas	98% Overseas	75% Domestic	100% Domestic	75% Domestic
Exemplar traits of manufacturing business before study period	Globally operating manufacturer of communications devices; strong engineering and IT competencies.	Globally operating manufacturer of healthcare devices; strong engineering, manufacturing, procurement, and regulatory competencies.	Globally operating manufacturer of light steel construction parts, Strong CAD and design competencies.	Leading domestic manufacturer and exporter of refrigeration products. Strong maintenance competence.	Leading designers of large hydro turbines. Strong engineering and IT competencies	One of largest developers of livestock IT products for primary sector; strong engineering and IT competencies.
Status of basic service provision before study period	Product advisory and involvement in the design of telecommunications networks projects	Advisory on research and design, regulatory sign off on some projects	Providing basic advisory services to assist customers with their projects.	Design advisory	Design advisory	Design advisory, software programming
Type of advanced services introduced during study period	Integration of customised design, software and maintenance solutions; assuming responsibility for the communications solution rather than the product	Integration and expansion of services (design, quality assurance, regulatory signoff); responsibility for the ongoing functioning and monitoring of the reliability of the solution	Integration of design, software programming, software training and Maintenance into contracts with customers	Design, financial services, maintenance services, asset management (fleet management)	Design, maintenance, procurement, consulting	Design, software programming, call centre, maintenance, consulting
Key Informants	Former and current CEOs	CEO	CEO	CEO/CFO	CEO/Ex-Senior executive	Former and current CEOs
# of interviews with key informants	7	4	4	5	4	4
Other informants	Supply Chain Managers External Analyst External Director	Staff External Analyst External Director	Staff External Director External Director	Staff CEO from another company in the sector Consultant	Staff CEO from another company in the sector Consultant	Staff CEO from another company in the sector External Director
# of interviews with the informants	5	4	3	5	6	3
Archival data type	Industry Report Media Reports Website	Industry Report Media Reports Website	Industry Report Media Reports Website	Industry Report Strategic Plan Website	Industry Report Annual Reports Media Reports Website	Industry Report Media Reports Website

the informal interviews had a probing character and focused mainly on expanding the evidence that was provided by the key informants. During the study, we have been also regularly communicating with key and other informants to continuously map the evolution of servitization and to address the gaps in our data. At the end of the study, the respondents reviewed and validated the findings.

3.3. Data coding and analysis

We followed several qualitative data analysis methods described in the literature (Miles et al., 2019; Yin, 2018). Table 2 outlines the approach we took in the three stages of the research and links to tables and sections of the paper that provide the evidence from the cases. In this section, we discuss two key aspects of the analyses reported in Table 2: the mapping of the development of first- and second-order capabilities over time and the assessment of the outcome of the servitization transformation process of the case firms.

The mapping of the development of first- and second-order capabilities over time drew on an emerging coding approach, to let the data “speak” (Huxham & Vangen, 2000), and ensure a holistic outlook on the research problem (Castka, 2018; Castka & Corbett, 2016; Su et al., 2014). To determine the development of first-order capabilities, our coding of the data led to the identification of an initial set of 34

indicators of firms' actions associated with changing routines for providing services. For each action, we produced a detailed explanation of the related context in the firm and the associated timing. For example, indicators included managerial actions such as “providing clear and realistic goals for servitization”, “setting up a decentralized and collaborative organizational structure”, “creating trust with suppliers whilst co-creating products and services together”. Essentially, these indicators represented the basic building blocks (skills, processes, organizational structures) from which organizational dynamic capability is built – or in other words, micro-foundations to build dynamic capabilities (Teece, 2007). At the next stage, we aggregated the indicators in nine micro-foundations – essentially grouping indicators of similar nature together. In doing so, we used the literature to understand the emerging categories and seek conceptual validation (Eisenhardt, 1989). For instance, the micro-foundation ‘managing resources for business continuity’ included indicators such as reallocation of existing resources such as appointing existing employees to new roles in advanced services or leveraging the existing IT infrastructure to support service management. This process involved several iterations, the result of which was a team consensus to group the 34 indicators into nine micro-foundations. The analysis also revealed that the nine micro-foundations could be further conceptually aggregated into three service-provision capabilities (new service development, managing

Table 2
The stages in the research process.

Stages in the research process	Objectives	Coding	Higher-level data analysis	Data interpretation process (Independent analysis by two researchers, followed by validation with respondents)	Evidence from cases provided in:
1. Initial evaluation (2015)	Learn about firms, their context and initial servitization status	Coding of instances of exemplar manufacturing traits and services offered or planned to be offered.	Consolidation and summary of evidence of: i) exemplar manufacturing traits; ii) basic and advanced services offered or planned to be offered.	Validation of exemplar nature of manufacturing activity. Classification of services as basic or advanced, through comparison with the respective definitions.	Table 1
2. Monitoring of transformation between 2015 and 2018	Determine first-order capabilities for service provision	34 indicators of actions associated with changing routines for the provision of services.	Grouping of indicators into nine micro-foundations and three service-provision capabilities, iterating between data and literature.	Two researchers independently grouped the indicators into micro-foundations and service-provision capabilities; differences resolved through dialogue and discussed with respondents.	Table 3 Section 4.1
	Determine the pathway of development of first-order capabilities	Identification of the timing of the actions associated with the three first-order capabilities.	Determination of pathways of development of first-order capabilities (sequential and parallel).	Clustering of actions by timing, verification with respondents.	Section 4.1
	Determine the challenges and second-order reconfiguring capabilities	Coding of challenges arising over time. 28 indicators of actions to address challenges associated with the development of reconfiguring capabilities.	Grouping of indicators into 12 micro-foundations and four reconfiguring capabilities, iterating between data and literature.	Two researchers independently determined challenges and reconfiguring capabilities; differences resolved through dialogue and discussed with respondents.	Section 4.2
	Determine the pathway to development of second-order reconfiguring capabilities and their linkage to first-order capabilities	Identification of the timing of the challenges and actions associated with second-order capabilities.	Determination of various pathways of development of second-order capabilities, iterating between data and literature.	Clustering of actions by timing, verification with respondents.	Table 4 Section 4.3
3. Final evaluation (2018)	Determine servitization transformation outcome	Identification of instances in qualitative and quantitative data that indicated firms' achievements and failures in servitization transformation.	Evaluation of transformation outcome based on a set of qualitative and quantitative criteria. Triangulation of instances in qualitative data with quantitative data.	Two researchers independently interpreted the data; differences resolved through dialogue and discussed with respondents.	Table 5 Section 4.3

service paradox and securing new markets) (see [Table 3](#)). These capabilities were then validated by the respondents.

To determine the development of second-order capabilities, we followed [Oliva and Kallenberg \(2003\)](#) service capabilities process model to identify challenges occurring during the transformation process and how they triggered actions as a response. We observed a number of actions (or routines) that firms were developing to address the challenges and that led to the reconfiguration of the previously identified first-order capabilities. We coded all instances of actions matching these requirements – resulting in 28 indicators. Iterating between the data and the literature, the indicators (being manifestations of skills, processes, organizational structures) were grouped into a set of 12 micro-foundations and furthermore classified into four higher-level categories of second-order reconfiguring capabilities: *interlinking collaboration*, *focus on uniqueness*, *business model revamp* and *long term perspective* (see [Table 3](#)). We followed the same analytical process that was used to determine the first order service provision capabilities. For example, in Firm A, the main challenge in the transformation process was a decrease in profitability, resulting from significant investments in the development of new advanced services. One of the responses to this challenge was to narrow the scope of advanced services being offered, focusing on a market niche in which the firm would excel. This change involved reconfiguring the first-order capability ‘New Service Development’ to concentrate on developing specialized services for that market niche. Thus, this particular response to the challenge qualified as a reconfiguring second-order capability (subsequently included under the category ‘Focus on Uniqueness’). These capabilities were also validated by the respondents.

Measuring and determining of servitization outcomes is challenging ([Ziaee Bigdeli et al., 2018](#)). In our study, we took advantage of rich case data to perform a holistic assessment of the transformation process ([Lexutt, 2020](#)), carried out at the final stage of the research (2018). This

assessment was based on the discussion with managers of: i) available performance data such as financial performance (e.g., profits, revenue) and service performance (service/product ratio; growth of revenue from services); ii) the extent to which the firm was able to introduce advanced service offerings. Based on these data, firms were labelled as High Achievers, Medium Achievers and Low Achievers (see [Table 5](#)). High Achievers were firms that showed evidence of a significant offering of advanced services in their markets, generating substantial revenue, with sound overall firm performance. Medium Achievers were firms that had an incipient offering of advanced services but showed evidence of sound overall firm performance and ongoing initiatives that might lead to an increase in the offering of advanced services in the future. Low Achievers were firms that were not able to introduce advanced services and had problematic overall performance.

In order to make sense of the overall dynamics of the transformation processes outlined above, we produced for each case firm a map of first-order and second-order capability development over time (pathways) and the observed outcomes ([Figs. B1–B6 in Appendix B](#)). We then performed a cross-case analysis of the maps employing “influences and affects” matrices ([Miles et al., 2019](#)) ([Table 5](#)). This analysis revealed clear links between the pattern of pathways followed by case firms and the transformation outcome. Through a theorizing process using the empirical data and the uncovered patterns ([Ketokivi & Choi, 2014](#)), we constructed a set of key findings which are reported in the next section.

4. Findings

4.1. Dynamic service provision capabilities and pathways to their development

Manufacturers focus on the development of first-order dynamic service provision capabilities in three main areas: *new service*

Table 3
First- and Second-order capabilities and micro-foundations.

	Capabilities	Micro-foundations
Service Provision Capabilities (first order)	New Service Development (NSD)	Providing motivational leadership Developing advanced services with customers
	<i>Development of resources and routines to provide new advanced services.</i>	Developing cross-functional project teams
	Managing Service Paradox (MSP)	Managing resources for business continuity Developing new employee skills for advanced services
	<i>Development of resources and routines to balance a simultaneous support for existing products and new services.</i>	Creating employee engagement
	Securing New Markets (SNM)	Leveraging firm's reputation Securing servitized contracts
	<i>Development of resources and routines leading to securing new markets for advanced services.</i>	Developing a network of strategic partners
Reconfiguring Capabilities (second order)	Interlinking Collaborations (IC)	Building a communication plan Aligning the supply chain
	<i>Development of resources and routines for deepening and interlinking collaboration ties within the firm as well as with supply chain partners and customers.</i>	Using partners to fill missing competencies
	Focus on Uniqueness (FoU)	Narrowing market niche Horizontal integration of servitized product
	<i>Development of resources and routines in areas that ensure uniqueness of service offerings.</i>	Focusing on close relationships
	Long Term Perspective (LTP)	Accommodating 'servitization' vision and strategy Improving long term strategic forecasting
	<i>Development of resources and routines for installing long term perspective in decision making processes – within a firm and with suppliers/partners.</i>	Designing long term measurable long-term goals
	Business Model Revamp (BMR)	Revamping organisation governance Flattening organizational structures
	<i>Development of resources and routines within new business models to strengthen supporting infrastructure for servitization transition.</i>	Redesigning Revenue Model

development (NSD), managing service paradox (MSP) and securing new markets (SNM; Table 3). We found that firms in our sample followed two main pathways in developing these service provision capabilities (see Figs. B1–B6 in the Appendix B for detailed aspects of pathways). Firms A, B and D concentrated primarily on the development of one capability at a time, avoiding overlap. They only moved to one capability once there was substantial progress on the former. Thus, these firms chose a sequential capability development pathway, and they all followed the same sequence: starting with NSD, through MSP to SNM. On the other hand, Firms C, E and F attempted to develop all or several service provision capabilities simultaneously, following a parallel pathway.

The pathways of the development of service provision capabilities ultimately impact the servitization transformation outcome. Firms that followed the sequential pathway showed higher likelihood of achieving a successful outcome. We return to more in-depth discussion of the pathways in section 4.4. Here it is worth mentioning that the successful outcome is associated with: i) the sequential development of first order capabilities in the specific sequence that was observed; ii) focussing on all the micro-foundations associated with each capability.

4.2. Second-order dynamic reconfiguring capabilities and pathways to their development

The development of servitization capabilities is a lengthy process, along which several challenges arise (Neely, 2008). Our data showed that challenges due to financing, cross-functional integration within a company and leadership related issues (motivation of employees, alignment of incentives) were present in some form or another in all firms (see Table 4 – column “Challenges and Triggers”). For instance, FIRM A experienced declining profitability during the transformation, creating nervousness with shareholders – putting the transformation process under stress and leading FIRM A to focus on *business model revamp* (BMR – see Fig. B1 in Appendix B). Financial challenges were observed in other firms even though these challenges were not so central to the transformation as it was in FIRM A. FIRM B for example, was driven by new opportunities in overseas markets that led the firm to develop *long term focus* (LTF) capabilities first (see Fig. B2 in Appendix B).

We found that firms adjusted, changed and aligned in response to major challenges associated with the transformation process by developing second-order reconfiguring capabilities (interlinking collaborations, focus on uniqueness, long term perspective and business model revamp – see the overview in Table 3 and the overview of their development at individual firms in Table 4). We also found that the firms in our sample that developed reconfiguring capabilities, did so sequentially. However, the specific sequence is specific to the context of the firm and reflects the nature of each firms' challenges (see Table 4 - column “Pathway”). For instance, if the challenge related to the ownership of the firm, development of *business model revamp* (BMR) is a natural first step in the development of reconfiguring capabilities. As managers from FIRM A asserted:

“We've had to back off a bit in terms of investment in [the] service area. There [was] a service function but it didn't have the fuel we are about to allow a third party to take a 40% stake in this company and inject a whole bunch of capital [into service provision capabilities].... We had to convince our stakeholders about the viability of this solution.... More of our customers are looking for solutions that span across both our traditional [products] and [new services]so we will put together a design, deploy, support services and maybe some managed services in there as well along with our partner”.

Table 4 provides an overview of challenges and how organizations addressed them through deployment of reconfiguring capabilities.

4.3. Interactions between first- and second-order dynamic capabilities and pathways to their development

Building the four types of reconfiguring capabilities had three types of impacts on service provision capabilities. First, reconfiguring capabilities allowed firms to sustain their service provision capabilities. The development of second order capabilities allowed firms to adopt adjustments, changes and consequently reconfiguration of first order capabilities. For example, changes to the business model (*business model revamp* – BMR) allowed firms to reconfigure their resourcing for servitization (as demonstrated previously in a quote from FIRM A). *Focus on uniqueness* (FoU) drove firms to reconfigure their new service development and often new partnerships were developed to ensure continuation of new service development. As managers from FIRM C asserted:

“We provide a lot more customisation and specialisation of our [offerings] compared to three years ago. This is opposite to what we did in the past. As part of the aftersales experience, we have invested in a very experienced group of technicians who are highly mobile and travel the globe from NZ, training local technicians to keep the local level of service to a high standard. It builds up trust and reliability in that you've got a

Table 4
Cross case analysis – Reconfiguring capabilities to address transformation challenges.

	Challenges and triggers	Reconfiguring Capabilities				Pathway
		Interlinking collaborations	Focus on Uniqueness (FoU)	Long Term Perspective (LTP)	Business Model Revamp (BMR)	
FIRM A	Profitability decreased. Unhappy stakeholders. Difficulty in providing in-house end-to-end service offerings.	Interlinked competences across existing supply chain partners. Integrated new partners to create an overall solution for customers.	Narrowed down the scope of the offering of advanced services; 'created' market niche in which the firm could excel.	Firm recognised that the decrease in profitability is temporary and convinced shareholders to continue to fund servitization. Managers and investors aligned around long term vision.	Major corporate restructure (new investors). Restructured organization to sell shares and raised the capital to continue with servitization transformation.	Deployment of all four reconfiguring capabilities to address challenges Sequence: BMR->LTP->IC->FoU
FIRM B	Parent company had different vision for servitization, joint venture split, and new investor sought who had similar vision. Clients sought bespoke one-stop-shop servitized solutions.	Integrated new supply chain partner. Deepened and interlinking collaborations with customers and suppliers, leading to growth in supply chain competences	Narrowed down the scope of the offering of advanced services; 'created' market niche in which the firm could excel, build reputation.	Split with joint venture partners to become 100% owned by a philanthropic investor who wanted them to expand in their market niche. Created a long-term focus on transformation with new investor on board.	Major expansion of organization in facilities and personnel	Deployment of all four reconfiguring capabilities to address challenges Sequence: LTP-> BMR ->IC->FoU
FIRM C	Profitability decreased after rapid expansion; existing resources stretched and lack of the right type of skills to market services. Disjointed global supply chain network. Best practice process needed to be communicated across the firm.	Created the Centre of Excellence to provide a platform for interlinking and synergizing of partners across the supply chain, especially downstream.	Became one stop shop for existing customers for integrated design, manufacture and build.	Not present: Realised that existing resources would be stretched long term; still addressing the resourcing.	Not present: No change to current business model.	Deployment of two reconfiguring capabilities to address challenges Sequence: FoU and IC. BMR, LTP not actioned
FIRM D	Profitability decreased. Clients unhappy. Unable to provide total solution for customers, needed extra resources and competences to meet customer demands. Organisation uneducated in providing advanced services.	In the ongoing process of interlinking partnerships domestically and internationally to cover lacking competences.	Became experts in "food technology & analytics" rather than just be known for selling product offerings.	Realised a need for more planning around integration of services into company (ongoing).	Recent creation of three divisions with own KPIs and organisational structure to support cross-functional collaboration.	Deployment of all four reconfiguring capabilities to address challenges Sequence: IC->LTP ->BMR->FoU
FIRM E	Inflated revenue forecasts, impatient shareholders wanting immediate profits. No mid to long-term business planning with unrealistic profit forecasts. No view or communication of what success/outcomes were going to be.	Not present: Working in silos, finding it difficult to promote collaboration.	Not present: Trying to be everything to everyone; continued pursuit of multiple and often conflicting revenue streams.	Not present: Inflated revenue forecasts. Impatient shareholders wanting immediate profits from services hamper amassing of continued funding for servitization transformation.	Not present: Although firms were acquired, firm E continued to work separately on existing and new contracts. Reduced collaboration across departments.	Did not deploy reconfiguring capabilities to address challenges
FIRM F	No business plan. No communication plan. Services not valued internally or externally, profitability down. Unable to gain confidence companywide of benefits of servitization in the long term.	Not present: Not focussed on servitization and supply chain partnerships; products and services working in silos.	Not present: Continued to serve the same markets as before the transformation	Not present: Ultimately turned their focus on selling the company rather than maintaining servitization transformation.	Not present: Although firm F acquired a product company (that had services), continued to work separately on existing contracts.	Did not deploy reconfiguring capabilities to address challenges

NOTE: Cells in grey correspond to the absence of reconfiguring capabilities.

programme that's well serviced, the customer will come back to your company to work together again."

Without addressing the challenges through the reconfiguring capabilities, firms experienced decline in the development of their service provision capabilities. In cases of FIRMs E and F, a lack of development of reconfiguring capabilities led to discontinuation of servitization transformation. For example, the liquidators had concluded that FIRM E had lacked "sufficient working capital, had staffing constraints and had little in the way of its own intellectual property despite winning major [industry] projects". Managers from FIRM E also lamented lack of development of reconfiguring capabilities, such as *long term focus (LTF)* – which ultimately harmed firm's effort to servitize:

"The board and shareholders were trying to maximise their investment and get their money back and list the business in Australia. They spent a tremendous amount of effort and time and money trying to list and they wanted their money, a quick turnaround".

Second, the development of the reconfiguring capabilities also led to further integration and interlinking of service provision capabilities. Through the development of second order capabilities, firms started to knit together the development of the service provision capabilities. Whilst the initial development of first order capabilities showed some level of interlinking, due to the development of reconfiguring capabilities firms introduced more alignment and integration. For example, managers at FIRM D described how developments in *Interlinking collaborations (IC)* reconfiguring capability led to developments in *Long*

Term Focus (LTF) and other reconfiguring capabilities (see Fig. B4 in Appendix B) - collectively contributing to tighter alignment of development of service provision capabilities:

"We created a centre of excellence which is accessed by all of our supply chain partners so we can provide expert assistance to our customers at each step of the supply chain. We've developed good documentation processes along the way, which also turns into a great aftersales experience and better collaboration. Everyone, including customers can access knowledge based on their business. better partnering and collaboration with other people and companies [led to development] of a seamless product."

In contrast, firms struggling with the development of reconfiguring capabilities recognised a negative impact of lack of development of reconfiguring capabilities on interlinking and alignment of the service provision capabilities. For example, FIRM F, struggled to integrate their internal functions as well as their customers. FIRM F focused on some aspects of integration (i.e., after sales services and engagement with their customers) yet failed to recognise the value of services within the business and reconfigure their business model. Ultimately, FIRM F failed to translate these attempts into a development of reconfiguring capabilities. One of the managers explained:

"[At the beginning of servitization], we ran it [new service development] separately, as a standalone entity for the very reason that services are different to products. [Later], we spent a lot of time on integration and probably went through three or four organisational design iterations...."

We hadn't got to the point where we had been attributing product sales to the services team [even though] there was a general recognition that they were starting to have an impact on the product business. [At the same time], [servitization managers] spent too much time on the help desk issues. These were some of the insights that came out of [help desk related activities] but it had little impact."

Third, the development of reconfiguring activities led to the deepening of the development of service provision capabilities. Notably, the deepening progressed as firms continued to develop all four reconfiguration capabilities. For example, FIRM B managers recognised that reconfiguring capabilities (described in Fig. B2 in Appendix B) allowed them to deepen the development of their service provision capabilities:

"We were selling [servitized products] to customers we already knew and had a relationship with, through their contract and bespoke work. What we know is (that) we are not getting to a lot of other customers that we know are out there, so the goal is to get to them.... We have open up the Australian market and developed relationships with new partners.... We provide other elements to our package such as the regulatory compliance – otherwise we would not shield off our competitors...we are not selling a thing; we are selling a complete package. We have applied all our knowledge onto our signature product, differentiating it from others".

In conclusion, reconfiguration capabilities significantly impact the development of service provision capabilities. Reconfiguration capabilities sustain their development, impact the integration and interlinking of the capabilities as well as deepening the development of service provision capabilities.

4.4. Pathways of development of dynamic capabilities and servitization transformation outcomes

The analysis revealed clear links between the pattern of pathways followed by case firms and the servitization transformation outcome (High Achievers, Medium Achievers, Low Achievers). Table 5 shows that firms which achieved a successful transformation (High Achievers, FIRMS A and B) followed similar pathways. First, they followed a sequential pathway of development of the three first-order service provision capabilities. At a given point in time, firms concentrated their resources in building very strong capabilities one by one (e.g., new service development) rather than spreading them across multiple capabilities. Moreover, they all followed a similar pathway, starting with new service development capability, progressing through managing service paradox capability before concentrating their efforts to securing new markets. In contrast, less successful firms (FIRMS C, E and F) attempted to develop of all or several service provision capabilities simultaneously, often finding it hard to resource the transformation. Second, successful transformation is associated with the development of four reconfiguring capabilities in response to challenges occurring during the transformation process (*interlinking collaborations, focus on uniqueness, long-term perspective, business model revamp*). The firms that developed reconfiguring capabilities did so in a sequential fashion. However, the particular sequence that was followed was specific to the context of the firm and the challenges that arose see Tables 4 and 5 and Figs. B1–B6 in Appendix B). These capabilities allowed firms to sustain, integrate and further develop their service provision capabilities.

In contrast, the two Low Achiever (FIRMS E and F) followed a parallel pathway of development of first-order service provision capabilities and failed to deploy reconfiguring capabilities. Interestingly, respondents acknowledged that reconfiguring capabilities routines should have been developed and we observed a consensus on what the capabilities should be. However, Low Achievers were not able to progress from intentions to the actual development of the capabilities, partly because of the negative consequences of the parallel pathway of development of first-order service provision capabilities. These firms were not able to introduce advanced services and had problematic overall

performance.

The Medium Achievers (FIRMS C and D) exhibited a pattern of development of capabilities in between the two extremes. While they developed two of the first-order service provision capabilities much like the High Achievers, at the end of our study they had not secured any new markets (SNM) and had not fully deployed reconfiguring capabilities. Although they recognised the need to develop these capabilities and had plans to do so, they had been unable to develop all of them by the end of the study. As we concluded our research project, these firms continued to transform and so it is possible that they would eventually follow the same path as High Achievers and attain similar outcomes. However, the findings concerning Low Achievers also raise the possibility that long delays in the deployment of reconfiguring capabilities might result in critical failure and the abandonment of the transformation process.

Overall, our findings show that: successful pathways of development of capabilities for servitization transformation are associated with: (1) developing dynamic service provision capabilities sequentially (new service development -> managing the service paradox -> securing new markets) and (2) continuously developing dynamic reconfiguring capabilities (in a sequence tailored to the firm's context) to overcome challenges in the development of service provision capabilities and sustain and the transformation process. Fig. 2 summarises our findings on the pathways of development of dynamic capabilities.

5. Discussion and conclusions

5.1. Implications for research

Our paper set out to address three goals related to pathways of development of dynamic capabilities. The first goal was to establish whether firms adopt universal sequences of capability development or sequences adapted to their own specific contexts. At a macro level, our study revealed that firms that successfully transformed, adopted two main stages of dynamic capability development that repeat iteratively over time (Fig. 2): development of (first-order) service provision capabilities, followed by the development of (second-order) reconfiguring capabilities. Thus, at a macro level there seems to be one desirable, fixed pattern of capability development over time. At a micro level, our findings indicate that firms that succeeded in the servitization transformation process followed a universal sequence of development of service provision (first-order) dynamic capabilities, built one at a time: starting with *new service development*, through *managing service paradox* to *securing new markets*. These capabilities are broadly in line with those identified in extant research (e.g., (Kowalkowski et al., 2017; Story et al., 2017)). However, the sequence of development of reconfiguring (second-order) capabilities was specific to each firm, specifically, to the particular challenges that occurred along the transformation process. The latter finding is in line with there not being a "single best way to servitize" (Martínez et al., 2017) and "path dependant characteristics of dynamic capabilities in which firms may practice differently" (Kindström et al., 2013). However, and interestingly, our findings also point to one desirable sequence of development of service provision capabilities.

The second goal was to understand the relationship between the decision to adopt sequential pathways versus parallel pathways and the outcomes of the servitization transformation process. Our findings show that successful firms developed service provision and reconfiguring capabilities in a sequential fashion. They only moved to one capability once there was substantial progress on the former. Consistent with this, when building one of the capabilities, successful firms deployed the full breadth of associated micro-foundations simultaneously. The finding is particularly significant in that it received replication across firms with different sizes. Thus, in line with manufacturing strategy notions (Schroeder et al., 2011) successful pathways of development of dynamic capabilities seem to require intense in-depth development of one capability at a time. This finding is broadly aligned with the servitization

Table 5

Cross Case Analysis – Overview of the key aspects of servitization transformation process.

	Service provision capability development pathway	Capability Development Process		Summary of capability development process	Servitization Transformation Outcome	
		Reconfiguring capability development pathway	Contribution of reconfiguring capabilities to transformation process		Assessment	Description
FIRM A	Sequential approach NSD - > MSP - > SNM	Sequential approach BMR- > LTP- > IC- > FoU	Successful in addressing challenges	Well managed and developed servitization capabilities	High Achiever	<ul style="list-style-type: none"> Revenue per employee increased by 2.5% during the study.¹ Products to service ratio went to 75/25 in 2018.² New services (design software programming, call centre, consulting) established and bringing revenue; penetrated new markets such as public utilities sector, which would not be possible without servitization.³
FIRM B	Sequential approach NSD - > MSP - > SNM	Sequential approach LTF- > BMR - > IC- > FoU	Successful in addressing challenges	Well managed and developed servitization capabilities	High Achiever	<ul style="list-style-type: none"> Revenue increased from 2016 to 2018 by 37.5%.¹ Products to service ratio went to 80/20 in 2018.² New services (product design, manufacture and product quality compliance) established and bringing revenue; penetrated new markets and increased sales to medical companies worldwide.³
FIRM C	All capabilities in parallel	Sequential approach FoU -> and IC, BMR, LTP not actioned	Missing meta-routines continued to hamper the transformation progress	Developed “high” levels of NSD capabilities, facing challenges in other capabilities but recognizing the challenges	Medium Achiever	<ul style="list-style-type: none"> Decrease in annual revenue between 2016 and 2018 (9%). Large investment up front acquiring service companies.¹ Products to service ratio went to 80/20 in 2018.² New services (software programming training) established but difficult to resource; penetrated new markets but resourcing problems slowing down the global expansion.³
FIRM D	Sequential approach NSD - > MSP - > SNM	Sequential approach IC- > LTP - > BMR- > FoU	Successfully addressed challenges (slow to adopt long term focus and changed business model only recently)	Developed high levels of NSD capabilities, facing challenges in other capabilities but recognizing the challenges	Medium Achiever	<ul style="list-style-type: none"> Annual revenue increased by 10% between 2016 and 2018 but mostly due to increase in product revenue.¹ Product service ratio went to 90/10 in 2018.² New services (design consulting, financial services, and product maintenance) introduced and bringing revenue though growing slowly; penetrated overseas markets.³
FIRM E	All capabilities in parallel	No capability development	Unsuccessful in addressing challenges	Initial success in developing service provision capabilities; not able to develop reconfiguring capabilities	Low Achiever	<ul style="list-style-type: none"> Annual revenue decreased between 2016 and 2017 and declared bankruptcy in 2018 with 12.6 million in losses.⁴ Established advanced services (such as design consulting, procurement services, maintenance) but losing money; have not penetrated new markets during servitization transformation.⁵
FIRM F	All capabilities in parallel	No capability development	Unsuccessful in addressing challenges	Initial success in developing service provision capabilities; not able to develop reconfiguring capabilities	Low Achiever	<ul style="list-style-type: none"> Annual services revenue decreased between 2016 and 2017 slightly increased in 2018 but not to 2016 level.³ New services (design programming software consulting, call centre, maintenance services) introduced but not bringing in new revenue. Revenue unchanged between 2016 and 2018.¹ Sold product lines to global manufacturer in 2018.²

NOTES:

NSD=New Service Development; MSP = Managing Service Paradox; SNM = Securing New Markets; IC=Interlinking Collaborations; FoU=Focus on Uniqueness; LTP = Long Term Perspective; BMR = Business Model Revamp.

1) data retrieved from industry reports published in 2016 and 2018; 2) data obtained from CEO; 3) data obtained from multiple informants in the case study firm; 4) data obtained from a liquidation report by Deloitte and from the annual report of the investor; 5) data obtained from the informants (Stage 1) and the annual report of the investor.

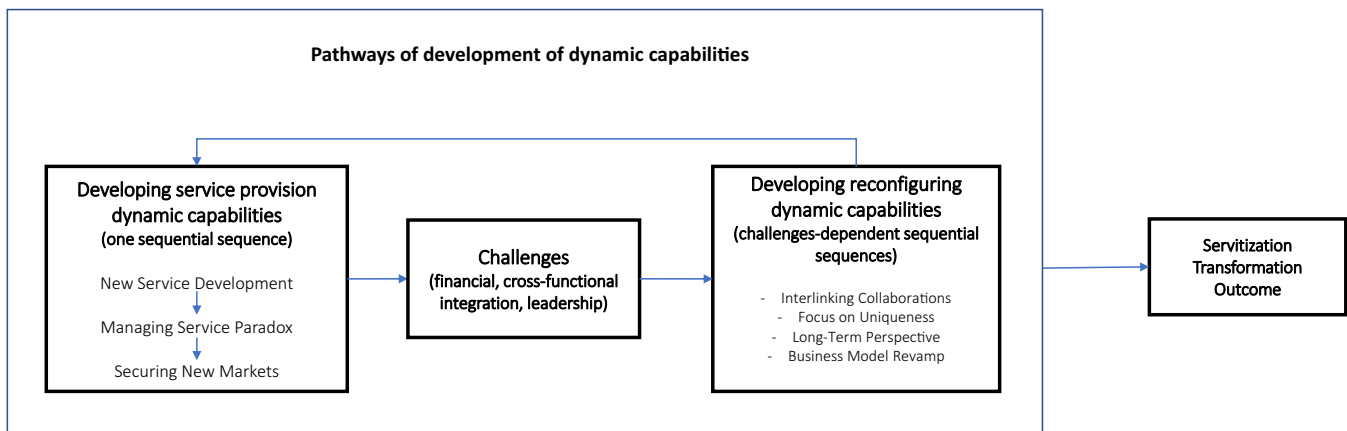


Fig. 2. Pathways of development of dynamic capabilities.

literature that points to the risks of resource constraints along the transformation process (Benedettini, Neely, & Swink, 2015; Reim, Parida, & Sjödin, 2016; Sousa & Da Silveira, 2020), but counter to the perspective that highlights the synergies resulting from the simultaneous development of capabilities (Ng et al., 2013; Visnjic et al., 2012). The sequential pathway presumably takes longer than the parallel pathway, but it seems necessary to avoid critical failure. However, our findings on Medium and Low Achievers also raise the possibility that overly long transformation processes may be undesirable.

The third goal was to examine interactions between different types of dynamic capabilities over time. Our study unveiled three significant impacts of (second-order) reconfiguring capabilities on (first-order) service provision capabilities. Over time, reconfiguring capabilities: i) sustain the development of service provision capabilities, by allowing firms to adjust and change such capabilities; ii) foster the integration and interlinking of the distinct service provision capabilities; iii) deepen the overall development of service provision capabilities. While other studies have alluded to the importance of “knitting” capabilities over time (e.g., Mont, 2002; Saul & Gebauer, 2018), our study is one of the first to uncover in detail mechanisms by which different reconfiguring and service provision capabilities work together over time to facilitate the servitization transformation process.

In addressing these goals with the benefit of in-depth, longitudinal data which included the measurement of holistic outcomes of the servitization transformation process, our study contributes to the literature addressing the process of servitization transformation in a number of ways. First, we complement existing transformation models (e.g., Baines et al., 2020; Martinez et al., 2017) by uncovering longitudinal regularities in dynamic capability development. Our study provides strong support to the continuous change transformational model according to which servitization transformation requires a gradual process of dynamic capability development, rather than a swift step development process (Kowalkowski et al., 2012). For reconfiguring capabilities, the sequence seems to depend on the firm's context. In addition, we found that the process of developing dynamic capabilities is not linear, there are significant interactions and change cycles between service provision and reconfiguring capabilities, and that at a micro level successful organizations may follow different pathways of development of dynamic capabilities. Therefore, our study also strongly supports the notion that the transformation process displays, to a more or less extent, continuous change which is not structured (Baines et al., 2020; Martinez et al., 2017).

Second, while the literature on servitization transformation has been extensively exploring the development of dynamic capabilities at firms (Coreynen et al., 2017; Kanninen et al., 2017; Kindström et al., 2013; Kowalkowski et al., 2017; Raddats et al., 2017; Story et al., 2017) the development of reconfiguring (second-order) capabilities and their

interaction with service provision (first-order) capabilities over time is less well understood. As we have demonstrated in our study, all firms have started with the development of service provision capabilities; however, only successful firms were able to initiate and develop second-order dynamic capabilities (unsuccessful firms fail to shift to this ‘next gear’). The development of these capabilities is triggered by challenges arising during the transformation process and lead to the reconfiguring of the service provision capabilities. A major contribution of our study is the realization that service provision capabilities do not seem to be sufficient for transformation success. What is, in particular, interesting, is that firms are often aware of the need to develop reconfiguring capabilities yet are not able to develop them. Overall, extant research has devoted limited attention to the role of the connections between first- and second order dynamic capabilities and their ‘knitting’ over time. Our study thus provides a more nuanced view on such connections, unveiling detailed mechanisms by which reconfiguring capabilities shape service provision capabilities over time.

Third, we contribute to the literature addressing success factors, risks and failures associated with servitization transformation processes. Empirical work has been hampered by reduced access to deep longitudinal data and failing transformation processes (Kindström et al., 2013). Large-scale econometric studies (Benedettini et al., 2015) have been important, yet due to their research approach, they have not been able to unravel the nuanced nature of servitization successes and failures. Our study delves into a process perspective of successful and unsuccessful transformation processes. In doing so, it provides in-depth understanding of how the pathways of development of dynamic capabilities over time influence the holistic outcome of the servitization transformation process. Specifically, the adoption of parallel capability development pathways, as well as the lack of development of second-order reconfiguring capabilities seem to harm the outcome of the servitization transformation process.

5.2. Implications for practice

This study is important for manufacturers that are considering servitization so that they are aware of the critical aspects of servitization transformation for planning of their strategic goals, organizational arrangements, and realistic financial arrangements for the transformation. Our study suggests that firms take a gradual approach to dynamic capability development and recommends that they start with service provision capabilities, in the sequence new service development, managing service paradox and securing new markets. In addition, it stresses the critical need for firms to develop second-order capabilities to reconfigure service provision capabilities over time and sustain the transformation process. Thus, the transformation process is demanding: not only does it require change in operational (zero-order) routines

(through service provision capabilities), but also the development of meta-routines to continuously reconfigure service provision capabilities. In order to do so, firms need to invest in organizational learning and flexibility (Zollo & Winter, 2002). Even though the need to develop second order capabilities is more likely at the latter stages of the transformation process, managers should be considering these capabilities at the planning stage of the servitization transformation. In particular, they may foster an environment that promotes organizational learning and reconfiguring in servitization implementation, as important sources of sustainable competitive advantage. Our study also warns managers against developing dynamic capabilities in parallel; this should be carefully considered at the planning stage to set expectations for the transformation timeframe and for the necessary resources.

Consistent with these challenges, our study found that, even though the firms in our sample were all considered exemplar manufacturing firms - all were recognised as leading firms in their markets as well as for their (mainly) manufacturing capabilities - not all were able to translate such reputation and outstanding capabilities to success in the service domain (see Case E). This should serve as a warning sign to manufacturing firms, even those that are highly successful: servitization posits a great deal of risk and managers might consider alternatives in order to increase their competitiveness.

5.3. Limitations and future research

Our study is theory building, drawing on analytical generalization and the replication logic (Yin, 2018) to further understand pathways of dynamic capability development. Future large-scale econometric studies should test our findings. Our study revealed the critical importance of second-order reconfiguring capabilities. Yet, research on service provision capabilities (first order capabilities) is much more developed than research on second order dynamic capabilities. Future research on servitization capabilities would benefit from shifting the focus to understanding the process of modification, development and enhancement of service provision capabilities, through reconfiguring capabilities. Such research will be necessary in various contexts, studying smaller and larger firms, as well as factoring in other variables, such as ownership of firms, their pre-servitization capabilities or characteristics of their markets and competition.

Our study suggests that sequential, potentially longer, pathways may be more appropriate, even in larger firms. However, it is conceivable that an overly long transformation process may also be undesirable. Future research might address the adequate pace of development of dynamic capabilities and how it might depend on firms' contexts, in particular, the level of slack resources. Since the level of slack resources is related to firm size, such studies should incorporate firms of different sizes. Our study includes firms ranging from 20 to 600 employees, which make up the large majority of most economies, but does not contain large multi-national firms which have often been the focus of extant empirical research (Fliess & Lexutt, 2019). It would be interesting to ascertain whether parallel pathways of capability development are feasible in large multi-national firms. Our findings also pointed to one desirable sequence of development of service provision capabilities (new service development, followed by managing the service paradox and securing new markets). Future research should establish the extent to which this particular sequence is generalizable.

Finally, while it is valuable for research to rationalise the transformation process and formulate path-based models, we also recommend that researchers continue to pay more attention to the complexity of the process. A promising avenue would be to study servitization transformation through the lens of complexity theory. This approach will require a recognition that there exist multiple configurations that lead to similar outcome(s) – which are also asymmetrical (Fiss, 2007; Fiss, 2011) – yet which provide more accurate approximation of the transformation process (Castka, 2018). More research in line with the configurational approach, such as Böhm et al. (2017), would be beneficial to further unravel the nuanced nature of the transformation process.

The servitization transformation process has been a subject of growing number of empirical studies and will likely continue to be a subject to many more studies in the future. We hope that our study on dynamic capabilities in the context of servitization transformation will contribute to further improve of understanding of this phenomenon as well as to an increased success of transformational processes in practice.

Data availability

The data that has been used is confidential.

Appendix A. Open ended interview questions

Stage 1: Start of the study (2015) – Firm's context, initial servitization status and prior history; start of the introduction of advanced services
 How would you describe your product/service offering? What type of services do you offer?
 Why did your company decide to add services to your product offering?
 How did you know what type of services to offer? How did the company transition to including services into the business?
 How was the company set up structurally to deliver services? What changes did you make to your original strategic objectives?
 Who sponsored and led the service innovation?
 How did you monitor and measure the servitization progress? How have you used technology to assist in providing services?
 What types of strategic partnerships do you have to assist in the delivery of the services? How are these strategic relationships managed?
 How is information transferred between strategic partners? Are there any plans in the future to extend services, bring in new service innovations? If so, then what are they likely to be?
 What challenges have you encountered in incorporating services into your business? How have you overcome these challenges?
 Stage 2: Follow-up visits in the period 2015–2018 – Monitoring of the transformation process
 What advanced services have you introduced and why?
 How did the company transition to including these services into the business?
 What changes did you introduce to deliver these services?
 What challenges have you encountered in introducing these services into your business? How have you overcome these challenges?
 Stage 3: End of the study (2018) – Outcome of the servitization transformation process
 How did the financial performance of the firm, including the product and service business, evolve over time?
 How did sales and profitability from services in general and advanced services in particular, evolve over time?
 How did the offering of advanced services evolve over time?
 Evaluation of the transformation process; validation of results from the firms.

Appendix B. Longitudinal analysis of case study firms

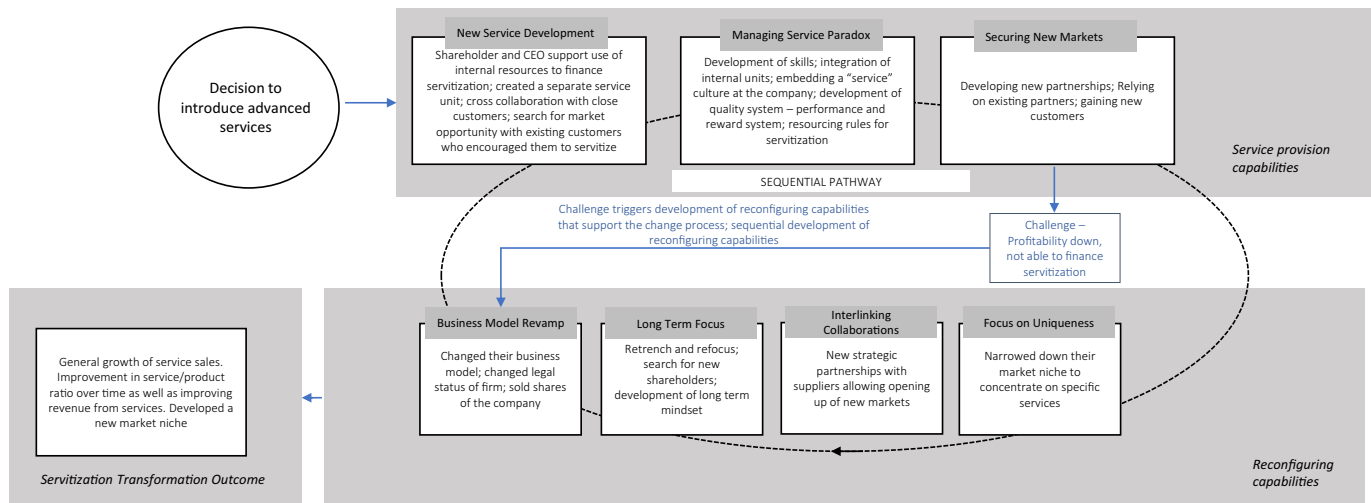


Fig. B1. FIRM A – longitudinal analysis.

NOTE: Grey boxes link to coding of the data; the dotted line indicates the evolutionary nature of the development of dynamic capabilities; the diagram shows how a challenge triggered a response and development of meta-routines

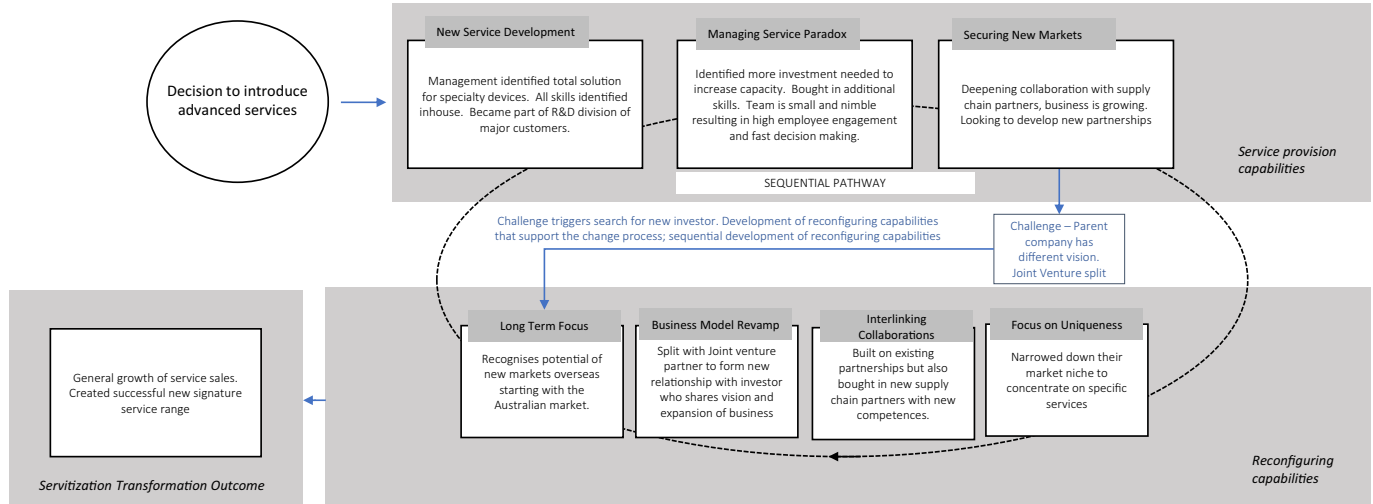


Fig. B2. FIRM B – longitudinal analysis.

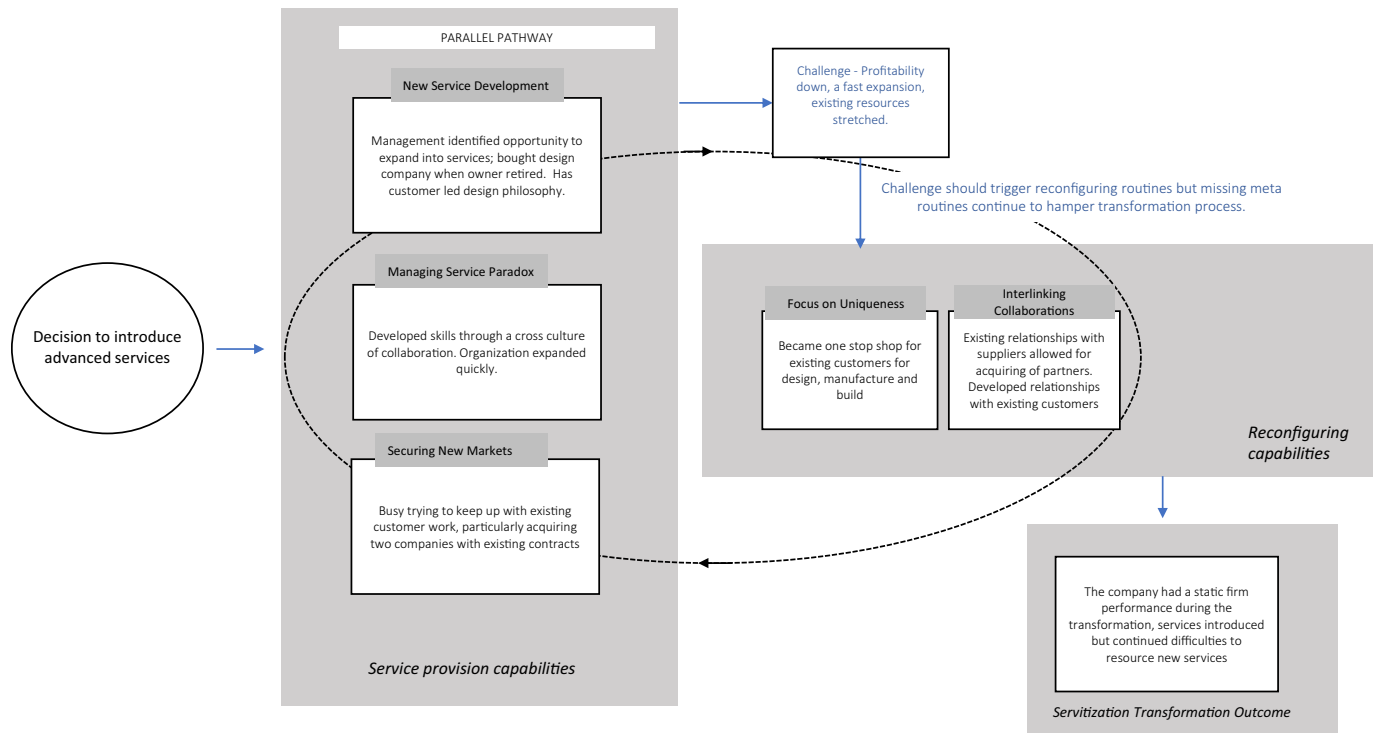


Fig. B3. FIRM C – longitudinal analysis.

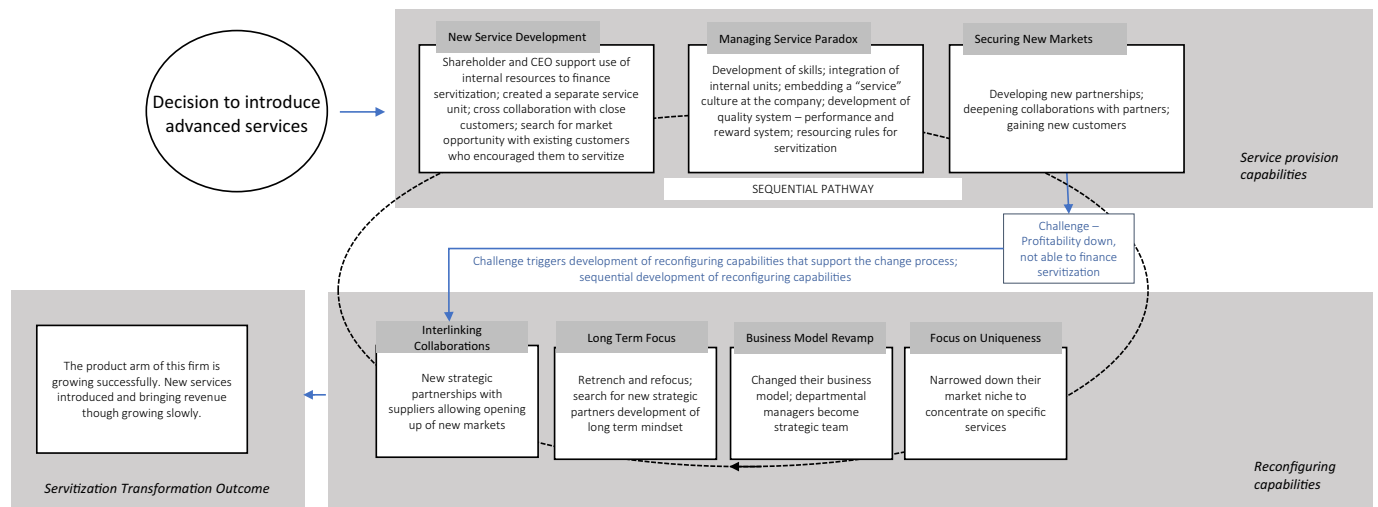


Fig. B4. FIRM D – longitudinal analysis.

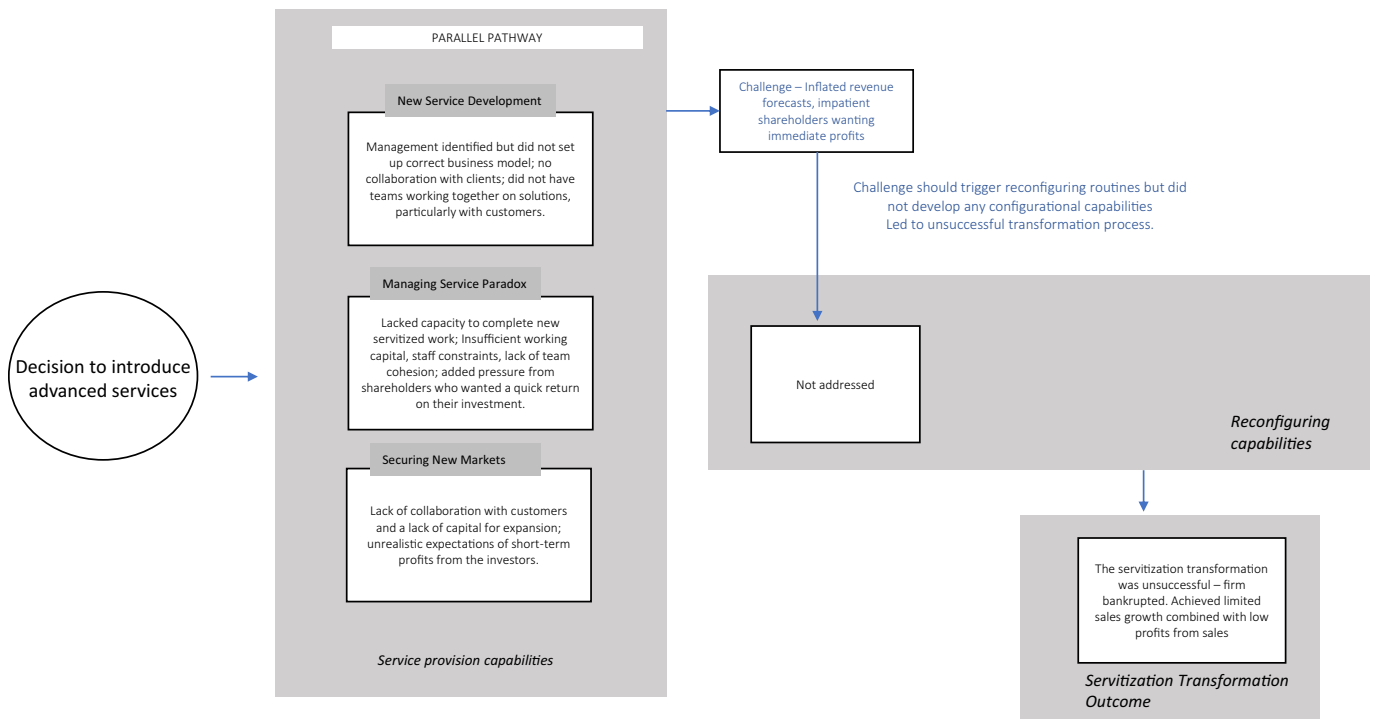


Fig. B5. FIRM E – longitudinal analysis.

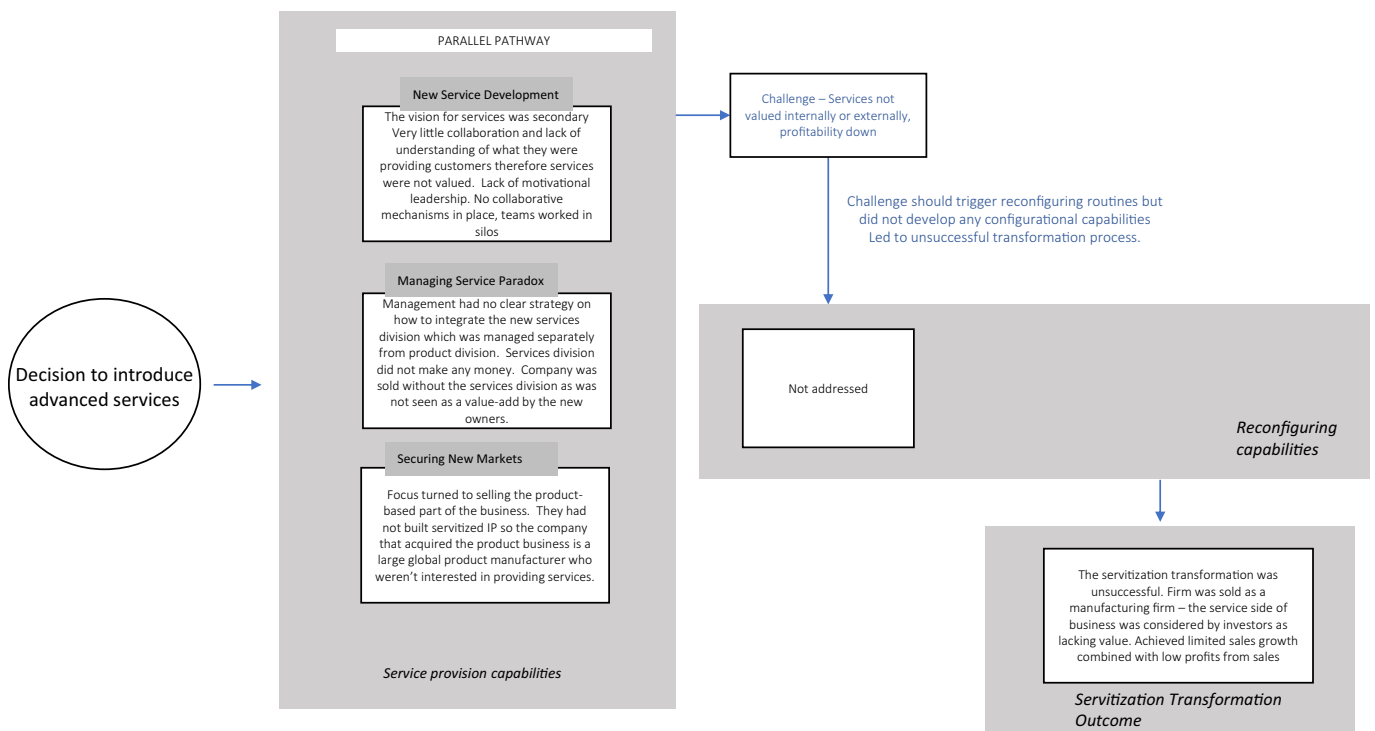


Fig. B6. FIRM F – longitudinal analysis.

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